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AIRFLOW SHROUD MOUNTED FAN SYSTEM AND METHOD FOR COOLING INFORMATION HANDLING SYSTEM COMPONENTS

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates in general to the field of information handling system cooling, and more particularly to an airflow shroud mounted fan system and method for cooling information handling system components.

Description of the Related Art

As the value and use of information continues to increase, individuals and businesses seek additional ways to process and store information. One option available to users is information handling systems. An information handling system generally processes, compiles, stores, and/or communicates information or data for business, personal, or other purposes thereby allowing users to take advantage of the value of the information. Because technology and information handling needs and requirements vary between different users or applications, information handling systems may also vary regarding what information is handled, how the information is handled, how much information is processed, stored, or communicated, and how quickly and efficiently the information may be processed, stored, or communicated. The variations in information handling systems allow for information handling systems to be general or configured for a specific user or specific use such as financial transaction processing, airline reservations, enterprise data storage, or global communications. In addition, information handling systems may include a variety of hardware and software components that may be configured to process, store, and communicate information and may include one or more computer systems, data storage systems, and networking systems.

Over time, information handling systems have consistently improved the speed and quantity of information they can process. This improved processing power results largely through the use of improved electronic components that pack more processing power in less space, such as greater numbers of transistors in processors or greater memory storage in double data rate memory. One difficulty with the greater processing power of information handling system components is that more compact and powerful components tend to create greater amounts of excess heat. The excess heat is typically removed from an information handling system housing with air blown by fans across components or heat sinks attached over components. Failure to remove adequate heat from an information handling system housing will destroy components or, in some cases, reduce the effectiveness of the components at processing information. For instance, the JEDEC DDRII specification presents challenging cooling requirements to maintain case and junction temperatures within the specification.

One solution to the greater amounts of heat produced by more powerful information handling systems is to include larger fans that pass air through housing layouts that improve cooling. However, housings have also decreased in size limiting the options for placement of components and the space available for cooling fans. Further, acoustic requirements have grown more strict as consumers demand quieter systems while larger cooling capacity fans tend to generate greater amounts of noise. One technique that has succeeded in providing more effective cooling for a fan of a given cooling capacity is the use of an airflow shroud that directs the airflow from a cooling fan across the component. Airflow shrouds narrow the width of the airflow provided by a fan so that a greater volume of air travels at a greater velocity over desired components to provide more effective cooling. However, as the heat generated by information processing components continues to increase, even a cooling airflow directed by a shroud has difficulty removing adequate excess heat to ensure proper operation of an information handling system.

SUMMARY OF THE INVENTION

Therefore a need has arisen for a method and system which enhances a cooling airflow provided by an airflow shroud across information handling system components in order to provide improved heat transfer.

In accordance with the present invention, a method and system are provided which substantially reduce the disadvantages and problems associated with previous methods and systems for cooling information handling system components. A fan couples to an airflow shroud proximate to the component and provides a cooling airflow directed at the component through an opening in the shroud.

More specifically, an airflow shroud couples to a housing to direct a primary cooling airflow provided with primary fans across processing components of an information handling system. An opening in the airflow shroud aligns with one or more processing components selected to receive a secondary cooling airflow. A secondary fan mounts to the airflow shroud at the opening to provide the secondary airflow substantially perpendicular to the component for impingement cooling of the component. The secondary fan removably mounts in a tooless manner to the airflow shroud for hot swapping by sliding into fan mount rails extending from the shroud on opposing sides of the opening. Electrical connectors of the fan and shroud align and connect when the fan slides into the rails. A finger guard mounts directly to the shroud in the opening to prevent inadvertent contact with the fan blades. The shroud rotationally couples to the housing with hinges so that pivoting the shroud generally perpendicular to the housing exposes the components disposed in the housing for service or hot swapping.

The present invention provides a number of important technical advantages. One example of an important technical advantage is that improved cooling airflow is directed at an information handling system component by cooling fan integration into an airflow shroud. Airflow directed perpendicular to the component has greater effectiveness for heat transfer than does airflow across the component so that smaller and quieter cooling fans provide a desired cooling effect. Integration of the fan on the airflow shroud leaves the fan accessible for hot swapping that allows the information

handling system to continue running as the fan is replaced. Service to underlying components is largely unaffected by the integrated cooling fan since the entire airflow shroud rotates to an open position that exposes the components without handling of the integrated cooling fan. Further, a finger guard incorporated in the airflow shroud below the integrated fan reduces the risk of injury to a technician during service of the information handling system components and provides reduced acoustics and improved airflow compared with a guard installed on the fan itself.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention may be better understood, and its numerous objects, features and advantages made apparent to those skilled in the art by referencing the accompanying drawings. The use of the same reference number throughout the several figures designates a like or similar element.

Figure 1 depicts a top perspective view of an airflow shroud having a secondary fan opening and integrated finger guard;

Figure 2 depicts a bottom perspective view of an airflow shroud forming an air channel;

Figure 3 depicts a top perspective view of an a secondary fan mounted on an airflow shroud;

Figure 4 depicts an information handling system having an airflow shroud rotated up to expose information processing components; and

Figure 5 depicts an information handling system having an airflow shroud with a secondary fan installed over a processing component.

DETAILED DESCRIPTION

Integration of a fan and an airflow shroud improves information handling system component cooling by providing a secondary flow at a component transverse to the airflow through the shroud for impingement cooling of the component. For

purposes of this application, an information handling system may include any instrumentality or aggregate of instrumentalities operable to compute, classify, process, transmit, receive, retrieve, originate, switch, store, display, manifest, detect, record, reproduce, handle, or utilize any form of information, intelligence, or data for business, scientific, control, or other purposes. For example, an information handling system may be a personal computer, a network storage device, or any other suitable device and may vary in size, shape, performance, functionality, and price. The information handling system may include random access memory (RAM), one or more processing resources such as a central processing unit (CPU) or hardware or software control logic, ROM, and/or other types of nonvolatile memory. Additional components of the information handling system may include one or more disk drives, one or more network ports for communicating with external devices as well as various input and output (I/O) devices, such as a keyboard, a mouse, and a video display. The information handling system may also include one or more buses operable to transmit communications between the various hardware components.

Referring now to Figure 1, a top perspective view depicts an airflow shroud 10 for directing airflow to cool information handling system components. Airflow shroud 10 directs cooling air drawn from a vent end 12 across information handling system components located under shroud 10 and out a fan exhaust end 14. Fan exhaust end 14 rests over two fans that pull the cooling air through shroud 10. As depicted by Figure 2, the inner surface of shroud 10 defines an airflow channel so that a greater portion of the air pulled by the fans passes across and cools information handling system components. The base 16 of shroud 10 locks to the housing of an information handling system with releasable bolts 18 and to the side of the housing with hinges 20. After installation within a housing, airflow shroud 10 rotates about hinges 20 when bolt 18 is released to allow access to components disposed below shroud 10.

A secondary airflow opening 22 formed in the upper surface of shroud 10 allows a secondary fan 24 to blow a secondary airflow into the air channel formed by the inner surface of shroud 10. A finger guard 26 mounts to opening 22 to protect against inadvertent insertion of an object into the blades of fan 24. Fan 24 mounts to shroud 10 at opening 26 by inserting the lower edges 28 of fan 24 into parallel rails 30

opposing each other across opening 22 and then sliding fan 24 into rails 30 to cover opening 22 as depicted by Figure 3. An electrical power source connection 32 aligns with a fan power connection 34 and connects upon complete insertion of fan 24 into rails 30. In addition, electrical connectors 32 and 34 may communicate information to and from the fan, such as tachometer readings and power control signals.

In operation, fan 24 and opening 22 align over one or more selected processing components, such as the CPU or memory of an information handling system, to provide transverse airflow downward toward the processing component for impingement cooling. The secondary airflow from fan 24 travels generally perpendicular to the primary airflow through the channel of shroud 10 to impact the upper portion of the desired component and flow air away from the center of the component. The close proximity of fan 24 to a component allows effective cooling airflows with reduced fan speeds so that thermal dissipation requirements are met with reduced acoustics. Improved airflow and reduced acoustics are also provided by the mounting of finger guard 26 in opening 22 instead of mounting of a finger guard on fan 24. The sliding rail fan mount 30 allows tooless insertion and removal of fan 24 to support hot swapping during operation of an information handling system.

Referring now to Figure 4, airflow shroud 10 is depicted installed in an information handling system 36 with base 16 rotated away from the lower surface of the housing 38 to expose processing components. Two primary fans 40 couple to housing 38 aligned under the fan exhaust end 14 of shroud 10. Fans 40 pull a primary airflow across information processing components disposed in housing 38, such as memory 42 and a CPU installed under a heat sink 44. In the raised position, fan guard 26 prevents inadvertent contact with fan 24, which continues to receive power through connector 32 by a power cord routed near hinges 20. The raised position permits service to components under shroud 10, such as hot swapping. Opening 22 aligns with CPU 44 so that closing of shroud 10 to the closed position depicted by Figure 5 directs the secondary airflow from fan 24 at CPU 44. Further, in the closed shroud position, fan 24 is accessible to a technician for hot swapping, such as for removal of a faulty fan and replacement with a new fan. In alternative embodiments, the secondary fan 24 may integrate in shroud 10 over other types of components to provide a desired secondary cooling airflow.

Although the present invention has been described in detail, it should be understood that various changes, substitutions and alterations can be made hereto without departing from the spirit and scope of the invention as defined by the appended claims.

5